

## Navigation Impacts Analysis (All Alternatives)

For Chapter 19, Transportation

Also, please add the following citations to the “References” section for Chapter 19:

- California Department of Water Resources, *Preliminary Estimates of Sediment Load at Proposed DHCCP Intakes* (June 28, 2012) Revision 2
- California Department of Water Resources, *DHCCP Intake Study: Preferred Intake Technology* (January 2011)
- California Department of Water Resources, *Technical Memorandum – Initial Intake Hydraulic Analyses* (April 15, 2010)
- Dinehart, R. L. (2002), *Bedform movement recorded by sequential single-beam surveys in tidal rivers*, *Journal of hydrology*, 258, pp 35-39.

### Alternative 1A

#### a. Potential Effects to Surface Elevations Caused by Intakes

##### i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 1A would be similar to those described for Alternative 4A. Although Alternative 1A includes two additional intakes (Alternative 1A includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 1A includes the construction of five fish-screened intakes (Intakes 1, 2, 3, 4, and 5) on the east bank of the Sacramento River between Clarksburg and Walnut Grove. Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are

covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 1A would be identical to those described for Alternative 4A, despite the fact that Alternative 1A includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 1A has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

With respect to Alternative 1A, operation of Intakes 1, 2, 3, 4, and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 1A, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to

navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 1A would be similar to those described for Alternative 4A. Although Alternative 1A includes two additional intakes (Alternative 1A includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental

impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 1A would be similar to those described for Alternative 4A. Although Alternative 1A includes a greater number of barge fleeting facilities (six compared to five for Alternative 4A), the effects to sedimentation caused by construction of the facilities is highly localized, and therefore, the greater number of barge facilities would not result in a greater level of impacts to navigation.

Alternative 1A includes six barge unloading facilities to be built on or near the tunnel alignment at riverbank locations about 5–6 miles apart (except on Woodward Canal) (See Mapbook Figure 15-1). The facilities would be built on the following waterways: Sacramento River, North Fork Mokelumne River, San Joaquin River, Middle River, and Woodward Canal (which would have two facilities). The temporary barge landings would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the barge landings would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 1A, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 1A would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 1A would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 1A would be similar to those described for Alternative 4A. Although Alternative 1A includes two additional intakes (Alternative 1A includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 1A would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 1A. An operable barrier at the

head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 1A would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 1A facilities.

**NEPA Effect:** Alternative 1A in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 1A in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

**Alternative 1B**

a. Potential Effects to Surface Elevations Caused by Intakes

i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 1B would be similar to those described for Alternative 4A. Although Alternative 1B includes two additional intakes (Alternative 1B includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 1B includes the construction of five fish-screened intakes (Intakes 1, 2, 3, 4, and 5) on the east bank of the Sacramento River between Clarksburg and Walnut Grove. Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each location. Coffey dams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface

upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 1B would be identical to those described for Alternative 4A, despite the fact that Alternative 1B includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 1B has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

With respect to Alternative 1B, operation of Intakes 1, 2, 3, 4, and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 1B, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction
    - (a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 1B would be similar to those described for Alternative 4A. Although Alternative 1B includes two additional intakes (Alternative 1B includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the



necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 1B would be similar in type to those described for Alternative 4A; however, the effect would be less because Alternative 1B includes fewer temporary barge unloading facilities.

Alternative 1B includes a temporary barge unloading facility to be built on Fourteenmile Slough, at the junction of the slough and the San Joaquin River (Mapbook Figure 15-2). The facility would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facility would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facility would involve piles.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 1B, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 1B would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to

navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 1B would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No Impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 1B would be similar to those described for Alternative 4A. Although Alternative 1B includes two additional intakes (Alternative 1B includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 1B would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the

proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 1B. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 1B would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 1B facilities.

**NEPA Effect:** Alternative 1B in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 1B in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

**Alternative 1C**

a. Potential Effects to Surface Elevations Caused by Intakes

i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 1C would be similar to those described for Alternative 4A. Although Alternative 1C includes two additional intakes (Alternative 1C includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 1C includes the construction of five fish-screened intakes (Intakes 1, 2, 3, 4, and 5) on the bank of the Sacramento River between Clarksburg and Walnut Grove. The planned locations of the intakes are generally the same as those proposed for Alternative 1A, as described previously, with the exception that intake facilities would be constructed on the west side of the river rather than the

east side. Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 1C would be identical to those described for Alternative 4A, despite the fact that Alternative 1C includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 1C has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

With respect to Alternative 1C, operation of Intakes 1, 2, 3, 4, and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower

intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 1C, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction
    - (a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 1C would be similar to those described for Alternative 4A. Although Alternative 1C includes two additional intakes (Alternative 1C includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-

term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 1C would be similar in type to those described for Alternative 4A; however, the effect would be less because Alternative 1C includes fewer temporary barge unloading facilities.

Alternative 1C includes two barge unloading facilities to be built on Cache Slough and the Sacramento River (Mapbook Figure 15-3). The facilities would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facilities would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facilities would involve piles at each location.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 1C, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff

and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 1C would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 1C would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No Impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 1C would be similar to those described for Alternative 4A. Although Alternative 1C includes two additional intakes (Alternative 1C includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 1C would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in

no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 1C. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 1C would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 1C facilities.

**NEPA Effect:** Alternative 1C in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 1C in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

**Alternative 2A**

a. Potential Effects to Surface Elevations Caused by Intakes  
i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 2A would be similar to those described for Alternative 4A. Although Alternative 2A includes two additional intakes (Alternative 2A includes five



intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 2A would include the construction of five fish-screened intakes on the west bank of the Sacramento River. Alternative 2A, however, could potentially entail two different intake and intake pumping plant locations. As an alternative to Intakes 1–5, intake locations 1, 2, 3, 6, and 7 are being considered. Unlike the other intakes, Intakes 6 and 7 would be downstream of Sutter and Steamboat Sloughs. Construction of the intakes would be accomplished using coffer dams at each location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 2A would be identical to those described for Alternative 4A, despite the fact that Alternative 2A includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 2A has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

With respect to Alternative 2A, operation of Intakes 1, 2, 3, 4, and 5, or Intakes 1, 2, 3, 6, and 7 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic

modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 2A, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction
    - (a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2A would be similar to those described for Alternative 4A. Although Alternative 2A includes two additional intakes (Alternative 2A includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 or Intakes 1, 2, 3, 6, and 7 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These

effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

#### (b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 2A would be similar to those described for Alternative 4A. Although Alternative 2A includes a greater number of barge fleeting facilities (six compared to five for Alternative 4A), the effects to sedimentation caused by construction of the facilities is highly localized, and therefore, the greater number of barge facilities would not result in a greater level of impacts to navigation.

Alternative 2A includes six barge unloading facilities to be built on or near the tunnel alignment similar to those described for Alternative 1A. The facilities would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facilities would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facilities would involve piles at each location.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 2A, the project proponents will ensure that a Barge Operations Plan is

developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 2A would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 2A would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No Impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2A would be similar to those described for Alternative 4A. Although Alternative 2A includes two additional intakes (Alternative 2A includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 2A would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there

is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Under Alternative 2A, an operable barrier would be placed at the head of Old River at the confluence with the San Joaquin River. The potential navigation impacts from construction and operations of Head of Old River barrier would be identical to those described for Alternative 4A.

Alternative 2A proposes work at the Head of Old River including the construction of fish and flow control gates as well as a small boat lock to allow recreational boat passage. An analysis of potential impacts of this work on navigation was completed in 2005 by Jones and Stokes (South Delta Improvements Program Vol I: Environmental Impact Statement/Environmental Impact Report. Draft. October. (J&S 020533.02.) State Clearinghouse #2002092065. Sacramento, CA.) ("SDIP EIS/EIR"). The SDIP EIS/R analyzed whether the proposed barrier/gates facility and locks would cause a change in south Delta flows or water level, river flows or surface water elevations that would result in substantial changes to existing recreational or commercial boating activity and opportunities.

The changes in access to Delta waterways by boats and other vessels during construction and operation of the gates, during channel dredging activities, and attributable to changes in water levels/depths were addressed. Most of the waterways in the immediate project vicinity are public waterways navigable by recreational craft, including rowboats, large houseboats, and cabin cruisers. These waterways are also navigable by smaller commercial vessels, including towing and salvage vessels, clamshell dredges, dredges for repair and maintenance of levees and channels, and pile-driving vessels. Boat access points in the project area include River's End Marina, located on the south side of the DMC, at the confluence with Old River; Tracy Oasis Marina Resort, located on the east side of Tracy Boulevard and the north side of Old River; and possibly at Heinbockle Harbor, located at Tracy Boulevard, on the south side of Grant Line/Fabian and Bell Canal.

According to a California Department of Parks and Recreation (DPR) survey, minimal boat

launching and use occurs in the project area. The channels within the project area are too small to accommodate large commercial vessels, and because the channels are also part of an existing temporary barriers project, larger vessels cannot use these channels when the barriers are in place. A boat lock at the proposed facility would ensure boat access upstream of the gate regardless of gate operations. In this regard, upstream boat access could improve over current conditions. Additionally, from June 16 through September 30, the gates will be open and no boat lock operations will be necessary.

With respect to both recreational and commercial navigation, and based on analysis provided in the SDIP EIS/EIR, boat access impacts during facility construction will be less than significant (p. 5.8-14, 5.8-18, 5.8-21), impacts to navigation caused by water level changes during barrier operation will be less than significant (p. 5.8-15, 5.8-19, 5.8-22), impact to non-recreational boaters due to temporary dredging operation will be less than significant (p. 5.8-16, 5.8-19, 5.8-22), and impacts on recreation as a result of constructing and operating any of the alternatives will not be significant (p. 7.4-1).

Construction of the operable barrier could result in increased sedimentation near the gates. Maintenance dredging around the gate would be necessary to clear out sediment deposits. Dredging around the gates would be conducted using a sealed clamshell dredge. Depending on the rate of sedimentation, maintenance would occur every 3 to 5 years. A formal dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities. Guidelines related to dredging activities, including compliance with in-water work windows and turbidity standards are described further in Appendix 3B, *Environmental Commitments*, under *Disposal and Reuse of Spoils, Reusable Tunnel Material (RTM), and Dredged Material*. These activities would ensure that sedimentation would not result in an adverse impact to navigation.

**NEPA Effect:** With respect to construction and operations of the Head of Old River Barrier, Alternative 2A would have no adverse effect on either commercial or recreational navigation activities.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, construction and operations of the Head of Old River barrier will not have a significant impact on navigation.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 2A would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 2A facilities.

**NEPA Effect:** Alternative 2A in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 2A in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 2B**

#### **a. Potential Effects to Surface Elevations Caused by Intakes**

##### **i) During Construction**

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 2B would be similar to those described for Alternative 4A. Although Alternative 2B includes two additional intakes (Alternative 2B includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 2B would include the construction of five fish-screened intakes on the west bank of the Sacramento River. Alternative 2B, however, could potentially entail two different intake and intake pumping plant locations. As an alternative to Intakes 1–5, intake locations 1, 2, 3, 6, and 7 are being considered. Unlike the other intakes, Intakes 6 and 7 would be downstream of Sutter and Steamboat Sloughs. Construction of the intakes would be accomplished using coffer dams at each location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

##### **ii) During Operation**

The potential impacts to navigation caused by changes in surface water elevation during

operation of the proposed intakes under Alternative 2B would be identical to those described for Alternative 4A, despite the fact that Alternative 2B includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 2B has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

With respect to Alternative 2B, operation of Intakes 1, 2, 3, 4, and 5, or Intakes 1, 2, 3, 6, and 7 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake diversions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 2B, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation



i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2B would be similar to those described for Alternative 4A. Although Alternative 2B includes two additional intakes (Alternative 2B includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 or Intakes 1, 2, 3, 6, and 7 would be accomplished using coffer dams at each intake location. Coffers dams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 2B would be

similar in type to those described for Alternative 4A; however, the effect would be less because Alternative 2B includes only one temporary barge unloading facility.

Like alternative 1B, Alternative 2B includes a temporary barge unloading facility to be built on Fourteenmile Slough, at the junction of the slough and the San Joaquin River (Mapbook Figure 15-2). The facility would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facility would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facility would involve piles.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 2B, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 2B would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 2B would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No Impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2B would be similar to those described for Alternative 4A. Although Alternative 2B includes two additional intakes (Alternative 2B includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 2B would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Under Alternative 2B, an operable barrier would be placed at the head of Old River at the confluence with the San Joaquin River. The potential navigation impacts from construction and operations of Head of Old River barrier would be identical to those described for Alternative 4A.

Alternative 2B proposes work at the Head of Old River including the construction of fish and flow control gates as well as a small boat lock to allow recreational boat passage. An analysis of potential impacts of this work on navigation was completed in 2005 by Jones and Stokes (South Delta Improvements Program Vol I: Environmental Impact Statement/Environmental Impact Report. Draft. October. (J&S 020533.02.) State Clearinghouse #2002092065. Sacramento, CA.) (“SDIP EIS/EIR”). The SDIP EIS/R analyzed whether the proposed barrier/gates facility and locks would cause a change in south Delta flows or water level, river flows or surface water elevations that would result in substantial changes to existing recreational or commercial boating activity and opportunities.

The changes in access to Delta waterways by boats and other vessels during construction and operation of the gates, during channel dredging activities, and attributable to changes in water levels/depths were addressed. Most of the waterways in the immediate project vicinity are public waterways navigable by recreational craft, including rowboats, large houseboats, and cabin cruisers. These waterways are also navigable by smaller commercial vessels, including towing and salvage vessels, clamshell dredges, dredges for repair and maintenance of levees and channels, and pile-driving vessels. Boat access points in the project area include River's End Marina, located on the south side of the DMC, at the confluence with Old River; Tracy Oasis Marina Resort, located on the east side of Tracy Boulevard and the north side of Old River; and possibly at Heinbockle Harbor, located at Tracy Boulevard, on the south side of Grant Line/Fabian and Bell Canal.

According to a California Department of Parks and Recreation (DPR) survey, minimal boat launching and use occurs in the project area. The channels within the project area are too small to accommodate large commercial vessels, and because the channels are also part of an existing temporary barriers project, larger vessels cannot use these channels when the barriers are in place. A boat lock at the proposed facility would ensure boat access upstream of the gate regardless of gate operations. In this regard, upstream boat access could improve over current conditions. Additionally, from June 16 through September 30, the gates will be open and no boat lock operations will be necessary.

With respect to both recreational and commercial navigation, and based on analysis provided in the SDIP EIS/EIR, boat access impacts during facility construction will be less than significant (p. 5.8-14, 5.8-18, 5.8-21), impacts to navigation caused by water level changes during barrier operation will be less than significant (p. 5.8-15, 5.8-19, 5.8-22), impact to non-recreational boaters due to temporary dredging operation will be less than significant (p. 5.8-16, 5.8-19, 5.8-22), and impacts on recreation as a result of constructing and operating any of the alternatives will not be significant (p. 7.4-1).

Construction of the operable barrier could result in increased sedimentation near the gates. Maintenance dredging around the gate would be necessary to clear out sediment deposits. Dredging around the gates would be conducted using a sealed clamshell dredge. Depending on the rate of sedimentation, maintenance would occur every 3 to 5 years. A formal dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities. Guidelines related to dredging activities, including compliance with in-water work windows and turbidity standards are described further in Appendix 3B, *Environmental Commitments*, under *Disposal and Reuse of Spoils, Reusable Tunnel Material (RTM), and Dredged Material*. These activities would ensure that sedimentation would not result in an adverse impact to navigation.

**NEPA Effect:** With respect to construction and operations of the Head of Old River Barrier, Alternative 2B would have no adverse effect on either commercial or recreational navigation activities.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, construction and operations of the Head of Old River barrier will not have a significant impact on navigation.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 2B would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 2B facilities.

**NEPA Effect:** Alternative 2B in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 2B in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 2C**

- a. Potential Effects to Surface Elevations Caused by Intakes
  - i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 2C would be similar to those described for Alternative 4A. Although Alternative 2C includes two additional intakes (Alternative 2C includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 2C includes the construction of five fish-screened intakes (Intakes 1, 2, 3, 4, and 5) on the bank of the Sacramento River between Clarksburg and Walnut Grove. The planned locations of the intakes are generally the same as those proposed for Alternative 1A, as described previously, with the exception that intake facilities would be constructed on the west side of the river rather than the east side. Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each location. Coffers dams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 2C would be identical to those described for Alternative 4A, despite the fact that Alternative 2C includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 2C has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

With respect to Alternative 2C, operation of Intakes 1, 2, 3, 4, and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 2C, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2C would be similar to those described for Alternative 4A. Although Alternative 2C includes two additional intakes (Alternative 2C includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 2C would be similar in type to those described for Alternative 4A; however, the effect would be less because Alternative 2C includes fewer temporary barge unloading facilities.

Alternative 2C includes two barge unloading facilities to be built on Cache Slough and the Sacramento River (Mapbook Figure 15-3). The facilities would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facilities would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facilities would involve piles at each location.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 2C, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 2C would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay



Alternative 2C would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No Impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2C would be similar to those described for Alternative 4A. Although Alternative 2C includes two additional intakes (Alternative 2C includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 2C would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Under Alternative 2C, an operable barrier would be placed at the head of Old River at the confluence with the San Joaquin River. The potential navigation impacts from construction and

operations of Head of Old River barrier would be identical to those described for Alternative 4A.

Alternative 2C proposes work at the Head of Old River including the construction of fish and flow control gates as well as a small boat lock to allow recreational boat passage. An analysis of potential impacts of this work on navigation was completed in 2005 by Jones and Stokes (South Delta Improvements Program Vol I: Environmental Impact Statement/Environmental Impact Report. Draft. October. (J&S 020533.02.) State Clearinghouse #2002092065. Sacramento, CA.) ("SDIP EIS/EIR"). The SDIP EIS/R analyzed whether the proposed barrier/gates facility and locks would cause a change in south Delta flows or water level, river flows or surface water elevations that would result in substantial changes to existing recreational or commercial boating activity and opportunities.

The changes in access to Delta waterways by boats and other vessels during construction and operation of the gates, during channel dredging activities, and attributable to changes in water levels/depths were addressed. Most of the waterways in the immediate project vicinity are public waterways navigable by recreational craft, including rowboats, large houseboats, and cabin cruisers. These waterways are also navigable by smaller commercial vessels, including towing and salvage vessels, clamshell dredges, dredges for repair and maintenance of levees and channels, and pile-driving vessels. Boat access points in the project area include River's End Marina, located on the south side of the DMC, at the confluence with Old River; Tracy Oasis Marina Resort, located on the east side of Tracy Boulevard and the north side of Old River; and possibly at Heinbockle Harbor, located at Tracy Boulevard, on the south side of Grant Line/Fabian and Bell Canal.

According to a California Department of Parks and Recreation (DPR) survey, minimal boat launching and use occurs in the project area. The channels within the project area are too small to accommodate large commercial vessels, and because the channels are also part of an existing temporary barriers project, larger vessels cannot use these channels when the barriers are in place. A boat lock at the proposed facility would ensure boat access upstream of the gate regardless of gate operations. In this regard, upstream boat access could improve over current conditions. Additionally, from June 16 through September 30, the gates will be open and no boat lock operations will be necessary.

With respect to both recreational and commercial navigation, and based on analysis provided in the SDIP EIS/EIR, boat access impacts during facility construction will be less than significant (p. 5.8-14, 5.8-18, 5.8-21), impacts to navigation caused by water level changes during barrier operation will be less than significant (p. 5.8-15, 5.8-19, 5.8-22), impact to non-recreational boaters due to temporary dredging operation will be less than significant (p. 5.8-16, 5.8-19, 5.8-22), and impacts on recreation as a result of constructing and operating any of the alternatives will not be significant (p. 7.4-1).

Construction of the operable barrier could result in increased sedimentation near the gates. Maintenance dredging around the gate would be necessary to clear out sediment deposits. Dredging around the gates would be conducted using a sealed clamshell dredge. Depending on the rate of sedimentation, maintenance would occur every 3 to 5 years. A formal dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities. Guidelines related to dredging activities, including compliance with in-water work windows and turbidity standards are described further in Appendix 3B, *Environmental Commitments*, under *Disposal and Reuse of Spoils, Reusable Tunnel Material (RTM), and Dredged Material*. These activities would ensure that sedimentation would not result in an adverse impact to navigation.

**NEPA Effect:** With respect to construction and operations of the Head of Old River Barrier, Alternative 2C would have no adverse effect on either commercial or recreational navigation activities.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, construction and operation of the Head of Old River operable barrier will not have a significant impact on navigation.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 2C would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 2C facilities.

**NEPA Effect:** Alternative 2C in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 2C in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

**Alternative 2D**

a. Potential Effects to Surface Elevations Caused by Intakes

i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 2D would be similar to those described for Alternative 4A. Although Alternative 2D includes two additional intakes (Alternative 2D includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 2D would include the construction of five fish-screened intakes on the west bank of the Sacramento River. Alternative 2D, however, could potentially entail two different intake and intake pumping plant locations. As an alternative to Intakes 1–5, intake locations 1, 2, 3, 6, and 7 are being considered. Unlike the other intakes, Intakes 6 and 7 would be downstream of Sutter and Steamboat Sloughs. Construction of the intakes would be accomplished using coffer dams at each location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to

river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 2D would be identical to those described for Alternative 4A, despite the fact that Alternative 2D includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 2D has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

With respect to Alternative 2D, operation of Intakes 1, 2, 3, 4, and 5, or Intakes 1, 2, 3, 6, and 7 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 2D, even

assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction
    - (a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2D would be similar to those described for Alternative 4A. Although Alternative 2D includes two additional intakes (Alternative 2D includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 or Intakes 1, 2, 3, 6, and 7 would be accomplished using coffer dams at each intake location. Coffers dams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to

Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 2D would be similar to those described for Alternative 4A. Although Alternative 2D includes a greater number of barge fleeting facilities, the effects to sedimentation caused by construction of the facilities is highly localized, and therefore, the greater number of barge facilities would not result in a greater level of impacts to navigation.

Alternative 2D includes six barge unloading facilities to be built on or near the tunnel alignment similar to those described for Alternative 2A. The facilities would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facilities would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facilities would involve piles at each location.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 2D, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff

and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 2D would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

The potential impacts to navigation from sedimentation at Clifton Court Forebay under Alternative 2D would be identical to those described for Alternative 4A. Clifton Court Forebay would be dredged and redesigned to provide an area where water flowing from the new north Delta facilities will be isolated from water diverted from south Delta channels. While Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 2D would be similar to those described for Alternative 4A. Although Alternative 2D includes two additional intakes (Alternative 2D includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 2D would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Under Alternative 2D, an operable barrier would be placed at the head of Old River at the confluence with the San Joaquin River. The potential navigation impacts from construction and operations of Head of Old River barrier would be identical to those described for Alternative 4A.

Alternative 2D proposes work at the Head of Old River including the construction of fish and flow control gates as well as a small boat lock to allow recreational boat passage. An analysis of potential impacts of this work on navigation was completed in 2005 by Jones and Stokes (South Delta Improvements Program Vol I: Environmental Impact Statement/Environmental Impact Report. Draft. October. (J&S 020533.02.) State Clearinghouse #2002092065. Sacramento, CA.) ("SDIP EIS/EIR"). The SDIP EIS/R analyzed whether the proposed barrier/gates facility and locks would cause a change in south Delta flows or water level, river flows or surface water elevations that would result in substantial changes to existing recreational or commercial boating activity and opportunities.

The changes in access to Delta waterways by boats and other vessels during construction and operation of the gates, during channel dredging activities, and attributable to changes in water levels/depths were addressed. Most of the waterways in the immediate project vicinity are public waterways navigable by recreational craft, including rowboats, large houseboats, and cabin cruisers. These waterways are also navigable by smaller commercial vessels, including towing and salvage vessels, clamshell dredges, dredges for repair and maintenance of levees and channels, and pile-driving vessels. Boat access points in the project area include River's End Marina, located on the south side of the DMC, at the confluence with Old River; Tracy Oasis Marina Resort, located on the east side of Tracy Boulevard and the north side of Old River; and possibly at Heinbockle Harbor, located at Tracy Boulevard, on the south side of Grant Line/Fabian and Bell Canal.

According to a California Department of Parks and Recreation (DPR) survey, minimal boat launching and use occurs in the project area. The channels within the project area are too small to accommodate large commercial vessels, and because the channels are also part of an existing temporary barriers project, larger vessels cannot use these channels when the barriers are in place. A boat lock at the proposed facility would ensure boat access upstream of the gate regardless of gate operations. In this regard, upstream boat access could improve over current conditions. Additionally, from June 16 through September 30, the gates will be open and no boat lock operations will be necessary.



With respect to both recreational and commercial navigation, and based on analysis provided in the SDIP EIS/EIR, boat access impacts during facility construction will be less than significant (p. 5.8-14, 5.8-18, 5.8-21), impacts to navigation caused by water level changes during barrier operation will be less than significant (p. 5.8-15, 5.8-19, 5.8-22), impact to non-recreational boaters due to temporary dredging operation will be less than significant (p. 5.8-16, 5.8-19, 5.8-22), and impacts on recreation as a result of constructing and operating any of the alternatives will not be significant (p. 7.4-1).

Construction of the operable barrier could result in increased sedimentation near the gates. Maintenance dredging around the gate would be necessary to clear out sediment deposits. Dredging around the gates would be conducted using a sealed clamshell dredge. Depending on the rate of sedimentation, maintenance would occur every 3 to 5 years. A formal dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities. Guidelines related to dredging activities, including compliance with in-water work windows and turbidity standards are described further in Appendix 3B, *Environmental Commitments*, under *Disposal and Reuse of Spoils, Reusable Tunnel Material (RTM), and Dredged Material*. These activities would ensure that sedimentation would not result in an adverse impact to navigation.

**NEPA Effect:** With respect to construction and operations of the Head of Old River barrier, Alternative 2D would have no adverse effect on either commercial or recreational navigation activities.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, construction and operations of the Head of Old River barrier will not have a significant impact on navigation.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 2D would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 2D facilities.

**NEPA Effect:** Alternative 2D in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 2D in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 3**

a. Potential Effects to Surface Elevations Caused by Intakes

i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 3 would be similar to those described for Alternative 4A. Although Alternative 3 includes one less intakes (Alternative 3 includes two intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the number of intakes would not substantially change the analysis. Nevertheless, because Alternative 3 includes less intakes, the effects to surface elevations caused by intakes would likely be less than those described for alternative 4A.

Alternative 3 includes the construction of two fish-screened intakes (Intakes 1 and 2) on the east bank of the Sacramento River. Construction for Intakes 1 and 2 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 3 would be similar in type to those described for Alternative 4A; however, the effect will likely be much less under Alternative 3 because Alternative 3 includes two intakes (one less than Alternative 4A) and because Alternative 3 has a 6,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). In any event, the hydraulic modeling scenario and analysis for changes in surface water elevations included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs). Again, because Alternative 3 includes only two intakes, and only 9,000 cfs capacity, the impact would be much less than described for Alternative 4A.

With respect to Alternative 3, operation of Intakes 1 and 2 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 3, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 3 would be similar in type to those described for Alternative 4A; however, the impacts would be less under Alternative 3 because Alternative 3 includes one less intake (Alternative 3 includes two intakes

compared to three for Alternative 4A). In any event, the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the lower number of intakes does not substantially change the analysis.

Construction for Intakes 1 and 2 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

#### (b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 3 would be similar to those described for Alternative 4A. Although Alternative 3 includes a greater number of barge fleeting facilities (six compared to five for Alternative 4A), the effects to sedimentation caused by construction of the facilities is highly localized, and therefore, the greater number of barge facilities would not result in a greater level of impacts to navigation.

Because it includes fewer intakes, Alternative 3 would involve fewer temporary barge fleeting

facilities than alternative 4A. The temporary barge landings would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the barge landings would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 3, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 3 would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 3 would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 3 would be similar in type to those described for Alternative 4A; however, the impacts under Alternative 3 would be less because Alternative 3 includes one less intake (Alternative 3 includes two intakes compared to three for Alternative 4A). In any event, the effects to sedimentation during operation of the proposed intakes

under Alternative 3 would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 3. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 3 would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned

Alternative 3 facilities.

**NEPA Effect:** Alternative 3 in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 3 in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

#### **Alternative 4**

##### **a. Potential Effects to Surface Elevations Caused by Intakes**

##### **i) During Construction**

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 4 would be identical to those described for Alternative 4A. The intakes included under Alternative 4 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Construction for Intakes 2, 3, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

##### **ii) During Operation**

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 4 would be identical to those described for Alternative 4A.

The hydraulic modeling scenario for this analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative. Alternatives with fewer intakes and/or lower diversion capacity, such as Alternative 4 (three intakes and 9,000 cfs maximum diversion capacity), would have less effects to surface water elevations.

With respect to Alternative 4, operation of Intakes 2, 3 and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. *Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8. This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 4, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impeded. There would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction



(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 4 would be identical to those described for Alternative 4A. The intakes included under Alternative 4 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Construction for Intakes 2, 3, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 4 would be identical to those described for Alternative 4A. Alternative 4 includes the same barge facilities as Alternative 4A.

Under Alternative 4, five temporary barge landings would be constructed at locations adjacent

to construction work areas for the delivery of construction materials. Each of the five proposed barge landings would include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the five barge landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 4, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 4 would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

The potential impacts to navigation from sedimentation at Clifton Court Forebay under alternative 4 would be identical to those described for Alternative 4A. Clifton Court Forebay would be dredged and redesigned to provide an area where water flowing from the new north Delta facilities will be isolated from water diverted from south Delta channels. While Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 4 would be identical to those described for Alternative 4A. The intakes included under Alternative 4 (three intakes

with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

The potential impacts to navigation caused construction and operations of Head of Old River barrier under Alternative 4 would be identical to those described for Alternative 4A.

Alternative 4 proposes work at the Head of Old River including the construction of fish and flow control gates as well as a small boat lock to allow recreational boat passage. An analysis of potential impacts of this work on navigation was completed in 2005 by Jones and Stokes (*South Delta Improvements Program Vol I: Environmental Impact Statement/Environmental Impact Report*. Draft. October. (J&S 020533.02.) State Clearinghouse #2002092065. Sacramento, CA.) (“SDIP EIS/EIR”). The SDIP EIS/R analyzed whether the proposed barrier/gates facility and locks would cause a change in south Delta flows or water level, river flows or surface water elevations that would result in substantial changes to existing recreational or commercial boating activity and opportunities.

The changes in access to Delta waterways by boats and other vessels during construction and operation of the gates, during channel dredging activities, and attributable to changes in water levels/depths were addressed. Most of the waterways in the immediate project vicinity are public waterways navigable by recreational craft, including rowboats, large houseboats, and cabin cruisers. These waterways are also navigable by smaller commercial vessels, including towing and salvage vessels,

clamshell dredges, dredges for repair and maintenance of levees and channels, and pile-driving vessels. Boat access points in the project area include River's End Marina, located on the south side of the DMC, at the confluence with Old River; Tracy Oasis Marina Resort, located on the east side of Tracy Boulevard and the north side of Old River; and possibly at Heinbockle Harbor, located at Tracy Boulevard, on the south side of Grant Line/Fabian and Bell Canal.

According to a California Department of Parks and Recreation (DPR) survey, minimal boat launching and use occurs in the project area. The channels within the project area are too small to accommodate large commercial vessels, and because the channels are also part of an existing temporary barriers project, larger vessels cannot use these channels when the barriers are in place. A boat lock at the proposed facility would ensure boat access upstream of the gate regardless of gate operations. In this regard, upstream boat access could improve over current conditions. Additionally, from June 16 through September 30, the gates will be open and no boat lock operations will be necessary.

With respect to both recreational and commercial navigation, and based on analysis provided in the SDIP EIS/EIR, boat access impacts during facility construction will be less than significant (p. 5.8-14, 5.8-18, 5.8-21), impacts to navigation caused by water level changes during barrier operation will be less than significant (p. 5.8-15, 5.8-19, 5.8-22), impact to non-recreational boaters due to temporary dredging operation will be less than significant (p. 5.8-16, 5.8-19, 5.8-22), and impacts on recreation as a result of constructing and operating any of the alternatives will not be significant (p. 7.4-1).

Construction of the operable barrier could result in increased sedimentation near the gates. Maintenance dredging around the gate would be necessary to clear out sediment deposits. Dredging around the gates would be conducted using a sealed clamshell dredge. Depending on the rate of sedimentation, maintenance would occur every 3 to 5 years. A formal dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities. Guidelines related to dredging activities, including compliance with in-water work windows and turbidity standards are described further in Appendix 3B, *Environmental Commitments*, under *Disposal and Reuse of Spoils, Reusable Tunnel Material (RTM), and Dredged Material*. These activities would ensure that sedimentation would not result in an adverse impact to navigation.

**NEPA Effect:** With respect to construction and operations of the Head of Old River Barrier, Alternative 4 would have no adverse effect on either commercial or recreational navigation activities

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, construction and operations of the Head of Old River barrier will not have a significant impact on navigation.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 4 would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects

of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 4 facilities.

**NEPA Effect:** Alternative 4 in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 4 in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

#### **Alternative 4A**

##### **a. Potential Effects to Surface Elevations Caused by Intakes**

##### **i) During Construction**

Construction for Intakes 2, 3, and 5 will be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

##### **ii) During Operation**

The hydraulic modeling scenario for this analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative. Alternatives with fewer intakes and/or lower diversion capacity, such as Alternative 4A (three intakes and 9,000 cfs maximum diversion capacity), would have less effects to surface water elevations. With respect to Alternative 4A, operation

of Intakes 2, 3 and 4 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. *Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8. This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 4A, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impeded. There would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

Construction for Intakes 2, 3, and 5 will be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in

incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

#### (b) Barge Facilities

Under Alternative 4A, five temporary barge landings would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the five proposed barge landings would include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the five barge landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 4A, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental*

*Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 4A would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Clifton Court Forebay would be dredged and redesigned to provide an area where water flowing from the new north Delta facilities will be isolated from water diverted from south Delta channels. While Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** Since Clifton Court Forebay is not open to navigation, there is no effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will



change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Alternative 4A proposes work at the Head of Old River including the construction of fish and flow control gates as well as a small boat lock to allow recreational boat passage. An analysis of potential impacts of this work on navigation was completed in 2005 by Jones and Stokes (*South Delta Improvements Program Vol I: Environmental Impact Statement/Environmental Impact Report*. Draft. October. (J&S 020533.02.) State Clearinghouse #2002092065. Sacramento, CA.) (“SDIP EIS/EIR”). The SDIP EIS/R analyzed whether the proposed barrier/gates facility and locks would cause a change in south Delta flows or water level, river flows or surface water elevations that would result in substantial changes to existing recreational or commercial boating activity and opportunities.

The changes in access to Delta waterways by boats and other vessels during construction and operation of the gates, during channel dredging activities, and attributable to changes in water levels/depths were addressed. Most of the waterways in the immediate project vicinity are public waterways navigable by recreational craft, including rowboats, large houseboats, and cabin cruisers. These waterways are also navigable by smaller commercial vessels, including towing and salvage vessels, clamshell dredges, dredges for repair and maintenance of levees and channels, and pile-driving vessels. Boat access points in the project area include River’s End Marina, located on the south side of the DMC, at the confluence with Old River; Tracy Oasis Marina Resort, located on the east side of Tracy Boulevard and the north side of Old River; and possibly at Heinbockle Harbor, located at Tracy Boulevard, on the south side of Grant Line/Fabian and Bell Canal.

According to a California Department of Parks and Recreation (DPR) survey, minimal boat launching and use occurs in the project area. The channels within the project area are too small to accommodate large commercial vessels, and because the channels are also part of an existing temporary barriers project, larger vessels cannot use these channels when the barriers are in place. A boat lock at the proposed facility would ensure boat access upstream of the gate regardless of gate operations. In this regard, upstream boat access could improve over current conditions. Additionally, from June 16 through September 30, the gates will be open and no boat lock operations will be necessary.

With respect to both recreational and commercial navigation, and based on analysis provided in the SDIP EIS/EIR, boat access impacts during facility construction will be less than significant (p. 5.8-14, 5.8-18, 5.8-21), impacts to navigation caused by water level changes during barrier operation will be less than significant (p. 5.8-15, 5.8-19, 5.8-22), impact to non-recreational boaters due to temporary dredging operation will be less than significant (p. 5.8-16, 5.8-19, 5.8-22), and impacts on recreation as a result of constructing and operating any of the alternatives will not be significant (p. 7.4-1).

Construction of the operable barrier could result in increased sedimentation near the gates. Maintenance dredging around the gate would be necessary to clear out sediment deposits. Dredging around the gates would be conducted using a sealed clamshell dredge. Depending on the rate of sedimentation, maintenance would occur every 3 to 5 years. A formal dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities. Guidelines related to dredging activities, including compliance with in-water work windows and turbidity standards are described further in Appendix 3B, *Environmental Commitments*, under *Disposal and Reuse of Spoils, Reusable Tunnel Material (RTM), and Dredged Material*. These activities would ensure that sedimentation would not result in an adverse impact to navigation.

**NEPA Effect:** With respect to construction and operations of the Head of Old River Barrier, Alternative 4A would have no adverse effect on either commercial or recreational navigation activities.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, construction and operations of the Head of Old River barrier will not have a significant impact on navigation.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 4A would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 4A facilities.

**NEPA Effect:** Alternative 4A in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 4A in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

**Alternative 5**

a. Potential Effects to Surface Elevations Caused by Intakes

i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 5 would be similar to those described for Alternative 4A. Although Alternative 5 includes two less intakes (Alternative 5 includes one intake compared to three for Alternative 4A), the effects to surface water elevation caused by construction of

the proposed intakes is highly localized, and therefore, the number of intakes would not substantially change the analysis. Nevertheless, because Alternative 5 includes less intakes, the effects to surface elevations caused by intakes would likely be less than those described for Alternative 4A.

Alternative 5 includes the construction of one fish-screened intake (Intake 1) on the bank of the Sacramento River. Construction for Intake 1 would be accomplished using coffer dams at each location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intake will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 5 would be similar in type to those described for Alternative 4A; however, the effect will likely be much less under Alternative 5 because Alternative 5 includes one intake (two less than Alternative 4A) and because Alternative 5 has a 3,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). In any event, the hydraulic modeling scenario and analysis for changes in surface water elevations included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs). Again, because Alternative 5 includes only one intake, and only 3,000 cfs capacity, the impact would be much less than described for Alternative 4A.

With respect to Alternative 5, operation of Intake 1 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows

(taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 5, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction
    - (a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 5 would be similar in type to those described for Alternative 4A; however, the impacts would be less under Alternative 5 because Alternative 5 includes two less intake (Alternative 5 includes one intake compared to three for Alternative 4A). In any event, the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the lower number of intakes does not substantially change the analysis.

Construction for Intake 1 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in

incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

#### (b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 5 would be similar in type to those described for Alternative 4A; however, because Alternative 5 includes a lower number of barge fleeting facilities, the effects to sedimentation caused by construction of the facilities would be much less under alternative 5.

Because it includes fewer intakes, Alternative 5 would involve fewer temporary barge fleeting facilities than Alternative 4A. The temporary barge landings would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the barge landings would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 5, the project proponents will ensure that a Barge Operations Plan is

developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 5 would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 5 would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 5 would be similar in type to those described for Alternative 4A; however, the impacts under Alternative 5 would be less because Alternative 5 includes two less intake (Alternative 5 includes one intake compared to three for Alternative 4A). In any event, the effects to sedimentation during operation of the proposed intakes under Alternative 5 would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the

intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 5. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 5 would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 5 facilities.

**NEPA Effect:** Alternative 5 in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as

explained above, Alternative 5 in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 5A**

#### **a. Potential Effects to Surface Elevations Caused by Intakes**

##### **i) During Construction**

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 5A would be similar to those described for Alternative 4A. Although Alternative 5A includes two less intakes (Alternative 5A includes one intake compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the number of intakes would not substantially change the analysis. Nevertheless, because Alternative 5A includes less intakes, the effects to surface elevations caused by intakes would likely be less than those described for alternative 4A.

Alternative 5A includes the construction of one fish-screened intake (Intake 2) on the bank of the Sacramento River near Clarksburg. Construction for Intake 2 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intake will not have a significant impact on navigation.

##### **ii) During Operation**

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 5A would be similar in type to those described for Alternative 4A; however, the effect will likely be much less under Alternative 5A because Alternative 5A includes one intake (two less than Alternative 4A) and because Alternative 5A has a 3,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). In any event, the hydraulic modeling scenario and analysis for changes in surface water elevations included five intakes because that is the



maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs). Again, because Alternative 5A includes only one intake, and only 3,000 cfs capacity, the impact would be much less than described for Alternative 4A.

With respect to Alternative 5A, operation of Intake 2 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 5A, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 5A would be similar in type to those described for Alternative 4A; however, the impacts would be less under Alternative 5A because Alternative 5A includes two less intake (Alternative 5A includes one intake compared to three for Alternative 4A). In any event, the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the lower number of intakes does not substantially change the analysis.

Construction for Intake 2 would be accomplished using coffer dams at each intake location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 5A would be similar in type to those described for Alternative 4A; however, because Alternative 5A includes a lower

number of barge fleeting facilities, the effects to sedimentation caused by construction of the facilities would be much less under Alternative 5A.

Because it includes fewer intakes, Alternative 5A would involve fewer temporary barge fleeting facilities than Alternative 4A. The temporary barge landings would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the barge landings would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 5A, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 5A would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

The potential impacts to navigation from sedimentation at Clifton Court Forebay under Alternative 5A would be identical to those described for Alternative 4A. Clifton Court Forebay would be dredged and redesigned to provide an area where water flowing from the new north Delta facilities will be isolated from water diverted from south Delta channels. While Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 5A would be similar in type to those described for Alternative 4A; however, the impacts under Alternative 5A would be less because Alternative 5A includes two less intake (Alternative 5A includes one intake compared to three for Alternative 4A). In any event, the effects to sedimentation during operation of the proposed intakes under Alternative 5A would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 5A. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 5A would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 5A facilities.

**NEPA Effect:** Alternative 5A in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 5A in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

#### **Alternative 6A**

- a. Potential Effects to Surface Elevations Caused by Intakes
  - i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 6A would be similar to those described for Alternative 4A. Although Alternative 6A includes two additional intakes (Alternative 6A includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 6A includes the construction of five fish-screened intakes (Intakes 1, 2, 3, 4, and 5) on the east bank of the Sacramento River between Clarksburg and Walnut Grove. Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each location. Coffers dams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 6A would be identical to those described for Alternative 4A, despite the fact that Alternative 6A includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 6A has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

Unlike Alternative 4A, this Alternative would be an *isolated conveyance*, no longer involving operation of the existing SWP/CVP south Delta points of diversion at Clifton Court Forebay and the Tracy Fish Facility on Old River. The proposed water operations under Alternative 6A would discontinue use of the existing SWP/CVP south Delta points of diversion at Clifton Court Forebay and the Tracy Fish Facility on Old River and convey up to 15,000 cfs from the north Delta. However, the north Delta intakes would be the same as Alternative 1A, and the difference in conveyance does not change the analysis of the intakes.

With respect to Alternative 6A, operation of Intakes 1, 2, 3, 4, and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 6A, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a

way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 6A would be similar to those described for Alternative 4A. Although Alternative 6A includes two additional intakes (Alternative 6A includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion

and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 6A would be similar to those described for Alternative 4A. Although Alternative 6A includes a greater number of barge fleeting facilities due to the higher number of intakes, the effects to sedimentation caused by construction of the facilities is highly localized, and therefore, the greater number of barge facilities would not result in a greater level of impacts to navigation.

Alternative 6A includes six barge unloading facilities to be built on or near the tunnel alignment at riverbank locations about 5–6 miles apart (except on Woodward Canal) (See Mapbook Figure 15-1). The facilities would be built on the following waterways: Sacramento River, North Fork Mokelumne River, San Joaquin River, Middle River, and Woodward Canal (which would have two facilities). The temporary barge landings would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the barge landings would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 6A, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.



**NEPA Effects:** Construction and operation of the barge facilities under Alternative 6A would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 6A would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 6A would be similar to those described for Alternative 4A. Although Alternative 6A includes two additional intakes (Alternative 6A includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 6A would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to

navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 6A. An operable barrier at the Head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 6A would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 6A facilities.

**NEPA Effect:** Alternative 6A in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 6A in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

**Alternative 6B**

a. Potential Effects to Surface Elevations Caused by Intakes

i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 6B would be similar to those described for Alternative 4A. Although Alternative 6B includes two additional intakes (Alternative 6B includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 6B includes the construction of five fish-screened intakes (Intakes 1, 2, 3, 4, and 5)

on the east bank of the Sacramento River between Clarksburg and Walnut Grove. Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 6B would be identical to those described for Alternative 4A, despite the fact that Alternative 6B includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 6B has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

Unlike Alternative 4A, this would be an *isolated conveyance*, no longer involving operation of the existing SWP/CVP south Delta points of diversion at Clifton Court Forebay and the Tracy Fish Facility on Old River. The proposed water operations under Alternative 6B would discontinue use of the existing SWP/CVP south Delta points of diversion at Clifton Court Forebay and the Tracy Fish Facility on Old River and convey up to 15,000 cfs from the north Delta. However, the north Delta intakes would be the same as Alternative 1A, and the difference in conveyance does not change the analysis of the intakes.

With respect to Alternative 6B, operation of Intakes 1, 2, 3, 4, and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the

lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 6B, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction
    - (a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 6B would be similar to those described for Alternative 4A. Although Alternative 6B includes two additional intakes (Alternative 6B includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and

would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

#### (b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 6B would be similar in type to those described for Alternative 4A; however, the effect would be less because Alternative 6B includes fewer temporary barge unloading facilities.

Alternative 6B includes a temporary barge unloading facility to be built on Fourteenmile Slough, at the junction of the slough and the San Joaquin River (Mapbook Figure 15-2). The facility would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facility would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facility would involve piles.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 6B, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to

AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 6B would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 6B would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 6B would be similar to those described for Alternative 4A. Although Alternative 6B includes two additional intakes (Alternative 6B includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 6B would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading

at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 6B. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 6B would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 6B facilities.

**NEPA Effect:** Alternative 6B in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 6B in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 6C**

a. Potential Effects to Surface Elevations Caused by Intakes

i) During Construction

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 6C would be similar to those described for Alternative 4A. Although Alternative 6C includes two additional intakes (Alternative 6C includes five intakes compared to three for Alternative 4A), the effects to surface water elevation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Alternative 6C includes the construction of five fish-screened intakes (Intakes 1, 2, 3, 4, and 5) on the bank of the Sacramento River between Clarksburg and Walnut Grove. The planned locations of the intakes are generally the same as those proposed for Alternative 1A, as described previously, with the exception that intake facilities would be constructed on the west side of the river rather than the east side. Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 6C would be identical to those described for Alternative 4A, despite the fact that Alternative 6C includes five intakes (two more than Alternative 4A) and despite the fact that Alternative 6C has a 15,000 cfs total conveyance capacity (compared to 9,000 cfs for Alternative 4A). This is because the hydraulic modeling scenario and analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative (15,000 cfs).

Unlike Alternative 4A, this Alternative would be an *isolated conveyance*, no longer involving



operation of the existing SWP/CVP south Delta points of diversion at Clifton Court Forebay and the Tracy Fish Facility on Old River. The proposed water operations under Alternative 6A would discontinue use of the existing SWP/CVP south Delta points of diversion at Clifton Court Forebay and the Tracy Fish Facility on Old River and convey up to 15,000 cfs from the north Delta. However, the north Delta intakes would be the same as Alternative 1C, and the difference in conveyance does not change the analysis of the intakes.

With respect to Alternative 6C, operation of Intakes 1, 2, 3, 4, and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. (*Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8.) This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 6C, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation and there would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 6C would be similar to those described for Alternative 4A. Although Alternative 6C includes two additional intakes (Alternative 6C includes five intakes compared to three for Alternative 4A), the effects to sedimentation caused by construction of the proposed intakes is highly localized, and therefore, the higher number of intakes would not result in a greater level of impacts to navigation.

Construction for Intakes 1, 2, 3, 4, and 5 would be accomplished using coffer dams at each intake location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 6C would be

similar in type to those described for Alternative 4A; however, the effect would be less because Alternative 6C includes fewer temporary barge unloading facilities.

Alternative 6C includes two barge unloading facilities to be built on Cache Slough and the Sacramento River (Mapbook Figure 15-3). The facilities would be used to transfer pipeline construction equipment and materials to and from construction sites and would be removed after construction was completed. The facilities would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the facilities would involve piles at each location.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 6C, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 6C would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 6C would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No Impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 6C would be similar to those described for Alternative 4A. Although Alternative 6C includes two additional intakes (Alternative 6C includes five intakes compared to three for Alternative 4A), the effects to sedimentation during operation of the proposed intakes under Alternative 6C would be similar to those described for alternative 4A for the reasons described below.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 6C. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 6C would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects

of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 6C facilities.

**NEPA Effect:** Alternative 6C in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 6C in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 7**

#### **a. Potential Effects to Surface Elevations Caused by Intakes**

##### **i) During Construction**

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 7 would be identical to those described for Alternative 4A. The intakes included under Alternative 7 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Construction for Intakes 2, 3, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

##### **ii) During Operation**

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 7 would be identical to those described for Alternative 4A.

The hydraulic modeling scenario for this analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative. Alternatives with fewer intakes and/or lower diversion capacity, such as Alternative 7 (three intakes and 9,000 cfs maximum diversion capacity), would have less effects to surface water elevations.

With respect to Alternative 7, operation of Intakes 2, 3 and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. *Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8. This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 7, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impeded. There would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation

during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 7 would be identical to those described for Alternative 4A. The intakes included under Alternative 7 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Construction for Intakes 2, 3, and 5 would be accomplished using coffer dams at each location. Coffers will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 7 would be identical to those described for Alternative 4A. Alternative 7 includes the same barge facilities as Alternative 4A.

Under Alternative 7, five temporary barge landings would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the five proposed barge landings would include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the five barge landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 7, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 7 would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 7 would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 7 would be



identical to those described for Alternative 4A. The intakes included under Alternative 7 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 7. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 7 would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned

Alternative 7 facilities.

**NEPA Effect:** Alternative 7 in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 7 in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 8**

#### **a. Potential Effects to Surface Elevations Caused by Intakes**

##### **i) During Construction**

The potential impacts to navigation caused by changes in surface water elevation during construction of the proposed intakes under Alternative 8 would be identical to those described for Alternative 4A. The intakes included under Alternative 8 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Construction for Intakes 2, 3, and 5 would be accomplished using coffer dams at each location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each coffer dam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). This represents the highest surface upstream elevation increase after coffer dam removal and during intake operation. Because this maximum increase in elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant. As a result, boat passage and river use, including Sacramento River tributaries, will not be affected.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

##### **ii) During Operation**

The potential impacts to navigation caused by changes in surface water elevation during operation of the proposed intakes under Alternative 8 would be identical to those described for Alternative 4A.

The hydraulic modeling scenario for this analysis included five intakes because that is the maximum number of intakes included under any alternative. The modeling also assumed the highest North Delta diversion capacity allowed under any alternative. Alternatives with fewer intakes and/or lower diversion capacity, such as Alternative 8 (three intakes and 9,000 cfs maximum diversion capacity), would have less effects to surface water elevations.

With respect to Alternative 8, operation of Intakes 2, 3 and 5 may have localized effects on water surface elevation during certain operational regimes and at various river flows. While intake operations and pumping levels are dictated by many factors, Sacramento River diversions are limited during low flows by operational rules. The nature and extent of impacts caused by diversions at an intake are dependent in large part on the location of the intake on the river. To minimize the intake effects on river surface elevations, intakes were designed as on-bank structures and were placed so that river flood and flow characteristic will be minimally altered. Based on hydrologic modelling, even at the lowest river flows (taking into account both seasonal and tidal variations) and at maximum intake operation (full diversions at each of five alternative intakes), estimates are that boat draft depths of at least 16.5 feet will be maintained within the Sacramento River. *Planning and Design of Navigation Locks* United States Army Corps of Engineers, EM 1110-2-2602 (September 30, 1995) pages 3-8. This river depth has occurred historically and has been adequate to support navigation along the Sacramento River. Additionally, under these same intake divisions/river flows, water surface elevations would be lowered by no more than 0.7 feet, which represents a localized and maximum estimate. Surface elevations downstream of the intakes would be affected less, and during higher river flow and lower intake diversions, river depths would be greater than the minimum estimate.

The minimal changes in surface water elevation anticipated under Alternative 8, even assuming a maximum lowering of 0.7 feet, would not likely expose any currently unexposed natural or man-made features that would affect or impeded. There would be no new snags or obstructions that would impede navigation.

Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities will have minimal impacts to aquatic species. It is unlikely that changes in flow velocity would be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

- b. Potential Effects on Navigation Caused by Sedimentation
  - i) Facility Construction

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 8 would be identical to those described for Alternative 4A. The intakes included under Alternative 8 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Construction for Intakes 2, 3, and 5 would be accomplished using coffer dams at each location. Cofferdams will isolate each construction area from the Sacramento River and will be used to de-water the construction area. Construction of coffer dams would require sheet pile driving that would result in incremental suspension of bed sediments. These effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects will be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

(b) Barge Facilities

The potential impacts to navigation caused by sedimentation under Alternative 8 would be identical to those described for Alternative 4A. Alternative 8 includes the same barge facilities as Alternative 4A.

Under Alternative 8, five temporary barge landings would be constructed at locations adjacent

to construction work areas for the delivery of construction materials. Each of the five proposed barge landings would include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the five barge landings would involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 8, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 8 would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 8 would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

The potential impacts to navigation caused by sedimentation under Alternative 8 would be identical to those described for Alternative 4A. The intakes included under Alternative 8 (three intakes with a maximum diversion capacity of 9,000 cfs) are identical to those included under Alternative 4A.

Sediment loads are present in the Sacramento River as bed loads or distributed within the water column. The Sacramento River is sediment “starved” for most of the year since upstream reservoirs act

as settling basins for suspended sediments. In most cases, sediment load is concentrated on the river bed and this bed load depends on several factors including particle size, particle density and flow velocity. To exclude bed loads from entering intake structures during operation, design criteria for the intakes require that the lowest point of the screen is placed above the river bed in such a way that there is no change in bed sediment erosion/distribution patterns. Additionally, screen locations for this alternative are placed on the outer bends of the river to minimize scour, erosion and sediment loading at those locations. Flow control baffles at intakes would be adjusted to control sedimentation near the screens as needed and air jets at screens are proposed to re-suspend sediments as needed.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Operational criteria and design specifications for intake operations will result in no change to water column or bed load sediment dynamics. Erosion and deposition patterns will change little if any during intake operation. As a result, there will be no adverse effect on navigation either near or downstream of the intake locations.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during operation of the proposed intakes will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Head of Old River Barrier

Operable barriers would not be constructed under Alternative 8. An operable barrier at the head of Old River would be constructed to support operations of Alternatives 2A, 2B, 2C, 2D, 4 and 4A only.

**NEPA Effect:** No affect.

**CEQA Conclusion:** No Impact.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 8 would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 8 facilities.

**NEPA Effect:** Alternative 8 in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 8 in combination with other reasonably foreseeable projects would not have a cumulatively significant impact on navigation.

### **Alternative 9**

#### **a. Potential Effects to Surface Elevations Caused by Intakes**

##### **i) During Construction**

As explained in Chapter 6, *Surface Water*, construction of the facilities included in Alternative 9 would require excavation, grading, or stockpiling at project facility sites or at temporary work sites. Site grading needed to construct any of the proposed facilities has the potential to block, reroute, or temporarily detain and impound surface water in existing drainages, which would result in increases and decreases in flow rates, velocities, and water surface elevations. Changes in drainage depths would vary depending on the specific conditions at each of the temporary work sites. As drainage paths would be blocked by construction activities, the temporary ponding of drainage water could occur and result in decreases in drainage flow rates downstream of the new facilities, increases in water surface elevations, and decreases in velocities upstream of the new facilities. These changes would not result in a substantial decrease in surface water elevation on any navigable waterways and therefore would not have an adverse effect on navigation.

Removal of groundwater during construction (dewatering) would be required for excavation activities. Groundwater removed during construction would be treated as necessary, and discharged to local drainage channels or rivers. This would result in a localized increase in flows and water surface elevations in the receiving channels. The increase in flows and water surface elevations in the receiving channels would not affect navigation.

Construction of facilities within water bodies would include the installation of cofferdams at each location. Intakes and screens have been designed to minimize changes to river flow characteristics. Nevertheless, some localized water elevation changes will occur upstream and adjacent to each cofferdam at these intake sites due to facility location within the river. These localized surface elevation changes will not exceed an increase of 0.10 feet at any intake location even at high river flows (when surface elevation changes would be expected to be highest). Any decrease in surface water elevations downstream of the cofferdams would be negligible and would not adversely affect navigation. Under existing regulations, USACE, CVFPB, and DWR would require installation of setback levees or other measures to maintain existing flow capacity in the waterways during construction and operations, which would prevent unacceptable increases in river water surface elevations under flood-flow conditions.

In total, Alternative 9 would result in alterations to drainage patterns, stream courses, and runoff; and potential for minimal increased surface water elevations in the rivers and streams during construction of facilities located within the waterway. Construction under Alternative 9 would not result in a substantial decrease in surface water elevations on any navigable waterways and therefore would not have an adverse effect on navigation. Although the increase in surface water elevations in rivers and streams under Alternative 9 creates a potential impact regarding flooding (which is considered less-than-

significant with implementation of Mitigation Measure SW-4) the changes in surface water elevation would not have any adverse effects on navigation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake construction are not considered adverse to navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during construction of the intakes will not have a significant impact on navigation.

ii) During Operation

Intake screens under Alternative 9 are designed to be hydrologically neutral. This is in part due to the proposed position of each intake (screen) at the confluence of the Sacramento and the Delta Cross Channel and Georgiana Slough and the fact that flows through the two intakes (screens) is not pumped. However, surface elevations could increase locally and adjacent to the facility. These localized surface elevation changes will not result in a significant decrease in surface water elevation at any location. Since there is no reduction in surface flows, navigation is not expected to be effected by changes in water levels near the intake screen facilities. Similarly, navigation is not expected to be effected by surface water level changes further upstream or downstream from the facilities during operation.

**NEPA Effects:** Water surface changes and potential impacts associated with intake operation are not considered adverse. Water depth and surface elevations will not be significantly effected (either localized or downstream of the intake structures) and will therefore not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in surface water elevation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in surface water elevation during operation of the intakes will not have a significant impact on navigation.

b. Potential Effects on Navigation Caused by Sedimentation

i) Facility Construction

(a) Intakes

As explained above under the discussion of potential effects to surface elevations during construction of the intakes for Alternative 9, Intake (screen) construction would involve some excavation, coffer dam installation and potential dewatering. Cofferdam installation with potential sediment accumulation near the facility is likely to result on a temporary basis during construction. Sedimentation that occurs near intakes during construction under Alternative 9 will be localized and short-term and will not have an adverse effect on navigation.

Moreover, potential sedimentation effects will be further minimized by limiting the



duration of in-water construction activities and through implementing the environmental commitments described in Appendix 3B, *Environmental Commitments*, including the commitment to *Develop and Implement Erosion and Sediment Control Plans* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. This commitment is related to Avoidance and Minimization Measure (AMM) 4, *Erosion and Sediment Control Plan*, described in BDCP Appendix 3.C. It is anticipated that multiple erosion and sediment control plans will be prepared for construction activities, each taking into account site-specific conditions such as proximity to surface water, erosion potential, drainage, etc. The plans will include all the necessary state requirements regarding erosion control and will implement BMPs for erosion and sediment control that will be in place for the duration of construction activities.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal and will not have an adverse effect on navigation.

**NEPA Effects:** Construction of coffer dams and intake construction would not have an adverse effect on navigation through increased sedimentation and erosion/deposition in the navigable channel.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation during construction of the intakes will not have a significant impact on navigation.

#### (b) Barge Facilities

Under alternative 9, temporary barge unloading facilities would be constructed at locations adjacent to construction work areas for the delivery of construction materials. Each of the barge landings would likely include in-water and over-water structures, such as piling dolphins, docks, ramps, and possibly conveyors for loading and unloading materials; and vehicles and other machinery. Construction of the landings would likely involve piles at each landing.

To address potential erosion and sedimentation impacts from barge facility construction associated with Alternative 9, the project proponents will ensure that a Barge Operations Plan is developed and implemented for facility construction. The requirements for the Barge Operations Plan are described in Draft EIR/EIS Appendix 3B, *Environmental Commitments*. This commitment is related to AMM7, *Barge Operations Plan*, described in BDCP Appendix 3.C. This plan will be developed and submitted by the construction contractors per standard DWR contract specifications. Erosion control measures during construction activities at project locations are provided in Appendix 3B, *Environmental Commitments*, as noted above in the discussion of the intakes. Fleeting facilities will be either docking facilities built through pile and wharves or loaded and unloaded using landward positioned cranes. In either case, through AMM7 and the Environmental Commitments, impacts to sedimentation through construction related activities will be localized and minimal.

Implementation of Mitigation Measure SW-4 (Implement Measures to Reduce Runoff and Sedimentation) will further ensure that impacts from sedimentation are minimal.

**NEPA Effects:** Construction and operation of the barge facilities under Alternative 9 would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation from the temporary barge facilities will not have a significant impact on navigation.

(c) Clifton Court Forebay

Alternative 9 would not involve expansion or modifications to Clifton Court Forebay. Moreover, while Clifton Court Forebay is a “navigable water,” use of the forebay is limited to maintenance operations and is not open to commercial or recreational navigation.

**NEPA Effects:** No effect.

**CEQA Conclusion:** No impact.

ii) During Operations

(a) Intakes

Alternative 9 proposes two fish screen facilities along the Sacramento River. A fish-screened intake will be constructed at the head of the Delta Cross Channel and Georgiana Slough. Each of the structures is about 2,500 feet long and is designed to prevent migrating fish species from entering the corridor. These screens will likely impact sediment transport along the Sacramento River near Walnut Grove, particularly the bed load. The sill of the intake will be constructed above the channel thalweg, which will limit the movement of the bed load along the channel. The bed sediment that would have entered into the Delta Cross Channel and Georgiana Slough will stay in the in the Sacramento River. The channel on the downstream of the intake gate will have less sediment loading which may lead to scouring of the levees. However, the potential scouring of the levees would result in minimal sedimentation and would not have an adverse impact on navigation. (See Chapter 10, Soils, for addition information on the potential for bank erosion.) There is also the potential for sediment buildup along the Sacramento River in front of and downstream of each intake structure. However, as explained in Chapter 3, Description of Alternatives, typical maintenance activities associated with river intakes would be performed to ensure that sediment buildup is controlled. These activities may include the following: (1) suction dredging around the intake structures using raft- or barge-mounted equipment and pumping sediment to a landside spoils area; (2) mechanical excavation around intake structures using track-mounted equipment and a clamshell dragline from the top deck after installing a floating turbidity control curtain to isolate the work area; and (3) dewatering the intake bays to remove sediment buildup using small front-end loading equipment and manual labor. These activities will ensure that sediment accumulation near the intakes would not have an adverse effect on navigation.

**NEPA Effects:** Construction and operation of the intakes under Alternative 9 would not have an adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation caused by changes in sedimentation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, changes in sedimentation caused by the operable barriers proposed under Alternative 9 will not have a significant impact on navigation.

c. Potential Navigation Impacts from Construction and Operations of Operable Barriers

Alternative 9 proposes 14 operable barriers along several channels in the central and south Delta. The construction and operation of the flow control barriers under Alternative 9 will block the natural movement of water through the existing channels. If the bottom of the gate is not matched with the bottom of the channel thalweg, it will alter the movement of bed load, which could lead to significant sediment impacts to some sloughs, such as Threemile Slough (Dinehart, 2002). In general, closing the barriers will create a pool of standing water on either side the gate. The standing water will provide areas for sedimentation which could reduce the channel capacity. Routine inspection of gate facilities and systems under Alternative 9 would occur annually. Some gates may not be required to operate for extended periods and would be operated at least two times per year. Each gate bay would be inspected annually at the end of the wet season for sediment accumulation. Sediment would be removed during the summer. These activities would ensure sedimentation near the operable barriers would not have an adverse effect on navigation.

**NEPA Effect:** With respect to construction and operations of the operable barriers, Alternative 9 would have no adverse effect on either commercial or recreational navigation activities.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, construction and operations of operable barriers under Alternative 9 barrier will not have a significant impact on navigation.

d. Potential Cumulative Effects on Navigation

As explained above and with respect to the construction and operation of these facilities, Alternative 9 would not result in an adverse effects to navigation due to water level elevation changes or altered sedimentation patterns. It is highly unlikely that other projects would combine with these impacts of the project to result in cumulative effects on navigation. This is because the minimal effects of these elements of the project on navigation are localized and would combine only with probable future projects if the projects were located immediately adjacent to the project components. There are no other reasonably foreseeable projects proposed to be located near or adjacent to the planned Alternative 9 facilities.

**NEPA Effect:** Alternative 9 in combination with other reasonably foreseeable projects would not have a cumulatively adverse effect on navigation.

**CEQA Conclusion:** Because it does not involve a physical change in the environment, effects to navigation, by themselves, are not considered environmental impacts under CEQA. Any secondary physical environmental impacts that may result are covered under other impacts. Nonetheless, as explained above, Alternative 9 in combination with other reasonably foreseeable projects would not

have a cumulatively significant impact on navigation.